

Abstract of the Disclosure

A dielectric structure formed on a substrate using a thin film deposition technique such as atomic layer deposition (ALD) includes at least one layer of current leakage inhibiting dielectric material, such as Al_2O_3 , HfO_2 , or ZrO_2 , for example, in combination with niobium oxide (Nb_2O_5). The Nb_2O_5 is either incorporated into the dielectric structure as a dopant in a layer of the current leakage inhibiting material or as one or more separate layers in addition to the layer or layers of current leakage inhibiting material. The dielectric structure may be used in miniature capacitors for integrated circuit devices such as DRAM devices, for example. In some embodiments, one or more capacitor electrodes are formed around the dielectric structure in the same ALD processing system. One or more of the electrodes may comprise a transition metal nitride, a noble metal, or a noble metal alloy.